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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/562,198

05/16/2006

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15287NP

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7590

07/29/2008

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EXAMINER

SUITTE, BRYANT P

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

07/29/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/562,198	<b>Applicant(s)</b> KARAMANEV, DIMITRE	
	<b>Examiner</b> BRYANT SUITTE	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-69 is/are pending in the application.
- 4a) Of the above claim(s) 20-69 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                        |                                                                   |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/23/05, 5/16/06, 4/7/08</u> .                               | 6) <input type="checkbox"/> Other: ____.                          |

**BIOFUEL CELL**

Examiner: Suitte

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July 17, 2008

***Election/Restrictions***

1. Applicant's election with traverse of Group I, claims 1-19, in Paper filed June 23, 2008 is acknowledged. The traversal is on the ground(s) that the election between the first group of invention (re: bio-fuel cell) and the second group of invention (re: a method for generating electricity) is being made with traverse. This is not found persuasive because the method for generating electricity requires the oxidizing of the second member which is not required by Group I, the bio-fuel cell systems. In addition, the method for generating electricity can be produced by four materially distinct bio-fuel cell systems as admitted in the instant disclosure.

The requirement is still deemed proper and is therefore made FINAL. Therefore, claims 20-69 are withdrawn from consideration.

***Specification***

2. The title, Biofuel Cell, of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 17-19 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The instant claims 17-19 comprises the phrase "voltage control means" that is not distinctly specified in the specification, thereby rendering the instant claims indistinct to one having ordinary skill in the art.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

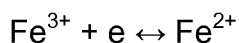
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 2, 4, 5, 6, 7, 8, 9, 15 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Tsunoda (EP 62,256,382).

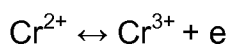
Regarding claims 1, 2, 6, 15 and 16, Tsunoda discloses a redox cell (biofuel cell) comprising a positive electrode (cathode compartment) (6), a negative electrode (anode compartment) (7) and a bioreactor (8). See figure 1. The redox solution contains ions having variable valence numbers, such as iron or chromium ions, as active materials. The solution is composed of a positive electrolyte and a negative electrolyte, which is supplied to a positive electrode chamber (6) and a negative electrode chamber (7), respectively, of a flow-through type electrolytic bath (5), said chambers being separated

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by a diaphragm (membrane permeable to protons) (15). See page 1. At the positive electrode the reaction shown below occurs:



The reduction aspect of the cell comprises a reducing gas (12), i.e. H<sub>2</sub> and city gas (methanol), photochemical reduction with optical catalyst, i.e. platinized titanium oxide, and bio-reaction reduction is performed in a tank (9). See abstract. The pump (16) introduces the reducing gas to the negative electrode chamber (7). See figure 1. The oxidation reaction shown below produces electrons.



Tsunoda discloses a diaphragm (15) (membrane for proton exchange) that separates the negative electrode chamber (7) from the positive electrode chamber (6). The microorganism (10) (bacteria, chemolithotrophic microorganism) is propagated by using energy produced in oxidation reaction and carbon dioxide in the air (oxygen) (17) as a carbon source, and separated with a suitable separating device. The air 16 is introduced into the bioreactor (8), and reaction of the positive electrolyte is  $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$ . The positive electrolyte, reproduced is returned (flow communication) to a flow-type electrolytic bath (5) through a pump (16), and the propagated microorganism or a metabolite is taken out from the reactor. See abstract.

Regarding claims 4 and 5, Tsunoda discloses trace nutrients such as copper sulfate, potassium phosphate and ammonium sulfate are added resulting in higher reaction rates. Tsunoda does not disclose that the nutrients can facilitate the growth of the microorganisms per se; however it can be concluded that the nutrients disclosed by

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Tsunoda can facilitate the growth of the microorganisms because the nutrients stated by Tsunoda and the instant application have similar chemical composition. See page 3.

Regarding claim 7, Tsunoda does not disclose an overall biofuel cell reaction of  $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O}$  per se. However, Tsunoda does disclose that hydrogen is supplied to the negative electrode chamber (7), where productions of electrons occur ( $\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$ ), and air (oxygen) (17) is supplied to the bioreactor. Therefore, it can be concluded that an overall reaction for the redox cell (bio-fuel cell) can be  $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O}$ .

Regarding claims 8 and 9, Tsunoda discloses bacteria (chemolithotrophic microorganisms), i.e. *Thiobacillus ferrooxidans*, *Leptospirillum ferrooxidans*, *Leptospirillum* bacteria, and *Sulfolobus*. *Acidithiobacillus ferrooxidans* and *Thiobacillus ferrooxidans* are synonyms as evidence by definition. See page 3.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunoda (EP 62,256,382) as applied to claims 1, 2, 4, 5, 6, 7, 8, 9, 15 and 16 above, and further in view of Ritts et al. (2003/0049511).

Regarding claim 3, Tsunoda discloses a redox cell that converts biofuel to energy comprising a diaphragm as recited in the above paragraph. However, Tsunoda does not disclose a diaphragm with an appropriate pore diameter.

Ritts discloses a trans-membrane proton transporting complex comprising a thickness (diameter) of 10 nanometers up to 10 micrometers. See paragraph 104. Therefore, it would have been obvious to one of ordinary skill in the art to utilize the membrane with the appropriate thickness with the redox cell of Tsunoda because Ritts discloses a membrane must be thick enough provide effective transportation of the proton across the membrane. See paragraph 104.

9. Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunoda (EP 62,256,382) as applied to claims 1, 2, 4, 5, 6, 7, 8, 9, 15 and 16 above, and further in view of Heller et al. (2008/0044721).

Regarding claims 10-14, Tsunoda discloses a redox cell that converts biofuel to energy as recited in the above paragraph. However, Tsunoda does not disclose the composition of the cathode electrode.

Heller discloses a cathode (104) comprising carbon (inert electrically conductive material) fibers (porous) coated with thin films of electrocatalyst layers (platinum) (108). Heller discloses the cathode comprising carbon in a plate form. See figure 1, 3a and 3b and paragraph 44 and 189. Therefore, it would have been obvious to one of ordinary skill in the art to utilize the cathode with the chemical composition as disclosed by Heller with the redox cell of Tsunoda because Heller teaches an electrochemical cell having

performance attributes that permit its use as a power source for an implanted device in a biological system, such as an animal, including a human, or a plant. See abstract.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYANT SUITTE whose telephone number is (571)270-3961. The examiner can normally be reached on Mon-Fri 10-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BS

/Dah-Wei D. Yuan/  
Supervisory Patent Examiner, Art Unit 1795